Digital Health Literacy and Its Associated Factors in General Population in Indonesia

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Article Info	ABSTRACT
	Digital health literacy is expected to help individuals deal with information necessary during the pandemic. This research aimed to assess digital health literacy and identify its associated factors among the general population in Indonesia. A cross-sectional online survey was used to elicit responses from the general population (aged ≥18 years) in Indonesia from 31 March 2022 to 7 April 2022. Along with sociodemographic characteristics, the 8-subscales scores on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) from the eHealth Literacy Scale (eHEALS) were employed to assess Digital Health Literacy (DHL) scores. Linear regression was used to test the correlation between factors. A total of 460 respondents participated in the research. The findings show that most respondents know how to find helpful health resources on the Internet (4.13±0.56), how to use the Internet to answer health questions (3.75±0.87), what kinds of health resources are available on the Internet (3.78±0.86), and how to use the health information on the Internet to help themselves (3.67±0.78). Digital literacy is significantly associated with age, education, occupation, family income, experience of having a chronic disease, use of prescribed medicine, and intensity of internet use (*p*=<0.05). The finding indicates that DHL in the general population in Indonesia is still limited in technical ability. Improving respondents' educational status through computer training, smartphone access, and perceived usefulness is necessary to improve digital health literacy skills in evaluating the quality of information. **Keywords**: digital health literacy, eHEALS, general population in Indonesia

INTRODUCTION

A pandemic has a global impact on society. It changes how people obtain public health information and speak about health. Everyone needs reliable and trustworthy information to cope with current and future disease outbreaks and social crises and increase health resources. Incorrect or inadequate information on the Internet can negatively impact users' doctor-patient interactions, involvement in preventative and screening programs, or adherence to medical treatment (Cline & Haynes, 2001).

During the pandemic, "infodemic" has been identified as an unavoidable obstacle not only for transmitting trustworthy knowledge, but also for limiting laymen to respond effectively due to confusing and conflicting information such as misinformation, disinformation, and mal-information (Hua & Shaw, 2020). This phenomenon spreads quicker than the pandemic itself, particularly through online social media platforms (Zarocostas, 2020). Furthermore, the abundance of complex and discordant information exacerbates the spread of fear and anxiety, causing more confusion, chaos, and panic among the public; this increases rates of depression, affects mental health, causes poor quality of life, and harms individuals' well-being (Abdel-Latif, 2020; Nguyen *et al.*, 2020). Given the current state of health, the problem of health literacy is critical to combat the disease, particularly in ensuring the healthcare system's readiness and mitigating its consequences on individual and community health.

Health literacy has been identified as a basic and critical aspect in improving healthcare quality, maintaining healthy lifestyles, improving people's well-being, adopting health-protective behaviours, and reducing health disparities (Greenhalgh, 2015; Nguyen *et al.*, 2020; Watson, 2011). However, several studies reveal that digital health literacy in developing countries is insufficient for sharing COVID-19-related information (Chereka *et al.*, 2022).

The eHealth Literacy Scale (eHEALS) is currently the widely used instrument specifically designed to measure eHealth literacy. The eHEALS tool was created to assess an individual's self-assurance in their capacity to find and assess health information on static webpages. Additionally, it serves as a guide for the creation and suggestion of health programs that suit a patient's perceived skill level in eHealth literacy (Norman & Skinner, 2006). The eHEALS was originally developed in English but has been tested and validated in multiple languages around the world, demonstrating strong psychometric properties across various populations such Amharic, Mandarin Chinese, Simplified Chinese, Dutch, German, Greek, Hebrew, Hungarian, Indonesian, Italian, Korean, Persian, Polish, Portuguese, Norwegian, Serbian, and Swedish. The eHEALS has been utilized to assess a variety of demographics, encompassing not just young individuals, adults, and seniors but also those who are in good health, patients, caretakers, and healthcare practitioners across educational institutions, communities, and medical facilities. The recall period for the eHEALS was defined as "at present," while other tools did not specify specific time periods for recall. The eHEALS is intended to offer a broad assessment of individual skills related to consumer eHealth (Lee *et al.*, 2021).

According to studies conducted in Pakistan, approximately 54.3% and 45.7% of the population have low digital literacy for sharing health-related information (Tariq *et al.*, 2020; Zakar *et al.*, 2021). Similar results are also shown in Iran and Ethiopia, namely 45.6% in Iran and 50.4% in Ethiopia (Chereka *et al.*, 2022; KHademian *et al.*, 2020). Similar studies have also been conducted in Indonesia, but no studies generally describe the picture of DHL in the general population in Indonesia (Harisanty *et al.*, 2021; Honey *et al.*, 2022; Wijaya & Kloping, 2021). Therefore, this research aimed to assess digital health literacy and identify its associated factors among the general population in Indonesia.

MATERIALS AND METHODS
Research design and participants

A nonrandomized sample (convenience sample) of the general public, adults (≥18 years) in Indonesia, participated in a national cross-sectional online survey from 31 March 2022 to 7 April 2022. The sample size was calculated based on the province's population, and each province's proportion was set at 20% of a targeted sample of 400 respondents. The number of samples reached 80 respondents in each of the five provinces in Indonesia. Data were analyzed for respondents who met the following inclusion criteria: 1) Indonesian nationality, 2) Must be at least 18 years old, 3) Have lived in an area for at least 6 months, 4) Have used gadgets to find information on the Internet, and 5) Have access to the online questionnaire. The questionnaire was pre-tested by emailing a link to students who were in contact with the initial author. Pre-testing data was not included in the final research. The questionnaire was delivered using Google Forms and distributed via a social media platform, WhatsApp.

Instrument

An Instrument was prepared as an online questionnaire and created using Google Forms. The questionnaire used in this research contained eHEALS (eHealth Literacy Scale) by Norman and Skinner, along with questions related to sociodemographic characteristics (Norman & Skinner, 2006). The questionnaire consists of 2 sections. The first section contains sociodemographic information (sex, age, educational level), field of work/study in the health sector, self-perceived health status, and internet health-related behaviour. The second section contains Indonesian adaptations of eHEALS, used to evaluate digital health literacy scores. The eHEALS consists of an 8-item test measuring consumers' knowledge, comfort, and perceived competency in locating, assessing, and using electronic health information to address health issues in general (Wijaya & Kloping, 2021). Age was gathered as a discrete variable in the form of years. Initially, educational attainment was measured using a 7-item scale and later aggregated into a 3-item scale (primary, secondary, tertiary). Working status was collected by asking respondents whether they were university students or workers. Respondents were asked a yes/no question about their experience studying or working in the health industry to differentiate from real-life experiences in the field. Self-rated health was collected by

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asking about previous experience of a chronic disease or still using prescribed medicine with a "yes" or "no" answer. Health-related internet use was measured by asking the frequency of internet use for health-related purposes (using a 7-item scale ranging from "less than 1 h per day" to "more than 10 h per day"). Indonesian translation of the 8 eHEALS items was retrieved from a previously reported version of the tool (I-eHEALS)(Wijaya & Kloping, 2021). The Indonesian-eHEALS, like the original version of the instrument, consists of 8 items scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A Previous study conducted item analysis producing a tight-fitting scale with $\alpha = 0.88$. Test-retest reliability showed modest stability over time from baseline to 6-month follow-up ($r = 0.68$ to 0.40). Principal components analysis produced a single-factor solution (56% of variance). Factor loadings ranged from 0.60 to 0.84 among the 8 items (Norman & Skinner, 2006)

Data analysis

Data analysis consists of descriptive and comparative analysis. Descriptive statistics (frequency, percentage, and mean [SD]) were calculated for sociodemographic variables (gender, age, educational attainment, and working status), self-rated health, and internet health-related behaviours for all groups. A comparative analysis using logistic regression analysis was performed to detect the correlation between demographic characteristics and digital health literacy level. The significance level was set at 0.05. The data were encoded and registered in a Microsoft Office Excel 2013® database and analyzed using IBM SPSS Statistics®, version 27.0.

Ethical Considerations

This research was approved by the ethics committee of the Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, with the number KE/FK/1023/EC/2022. Background and research objectives information was given to participants as soon as they visited the website where the survey was being conducted. Informed written consent was obtained before filling out the questionnaires.

RESULTS AND DISCUSSION
Respondents' Characteristics

A total of 460 respondents participated in the survey, and all considered valid (Table I.) The demographic characteristics of the respondents provided a considerable dataset, which consisted of a balanced representation of male (48.04%) and female (51.96%) respondents. As expected from the demographics of Indonesia's population, females represented the main proportion. Most respondents were aged between young adults (18-35 years old). A notable percentage of participants were young adults under the age of 30, accounting for 76.74% of the sample.

The majority of respondents were university students (39.13%), suggesting that the study engaged a relatively educated demographic with tertiary education levels reported in 35% of participants. This is important as higher education levels might correlate with better health literacy.

The group with work practice in the health sector represented 12.2% (n=56). Family income levels varied, with 26.96% of families earning under 3 million and only 15.43% earning over 10 million, painting a picture of economic diversity within the population. This has implications for access to health information and resources, which is often tied to economic status.

About a third presented previous experience of having a chronic disease (29.1%), and 36.3% (n=167) used prescribed medicine.

Digital behavior within the population showed a significant trend towards high internet usage, with more than 42% using the internet for over 10 hours a day. The devices used for internet searches were predominantly smartphones (45.65%), which underscores the need for mobile-friendly health information platforms. Smartphones were the most popular device for internet searching, followed by computers. According to the household ownership rate of devices in Southeast Asian countries in 2011, 78% of the Indonesian population chose an internet-capable mobile phone compared to a desk computer or laptop (Puspitasari & Ishii, 2016). This is in line with the increase in the number of internet users in Indonesia, where Indonesia has returned to being a country in Southeast Asia with the highest increase in the number of internet users, reaching 15% from 144 million in 2020 to 165 million in 2021(No name, 2022).

Digital health literacy score among community in Indonesia

In order to determine respondents' DHL, we used the instrument (eHEALS) to measure respondents' knowledge in searching for health-related information on the Internet (Norman & Skinner, 2006). The mean of the score of each item

ranged from 4.13 (SD= 0.56) to 3.12 (SD= 1.11) as presented in Table II below. Table II reports the mean scores and standard deviations of participants' responses to the eHEALS scale. On a five-point Likert scale, respondents rated various aspects of their digital health literacy. The mean score for item 1, "I know how to find helpful health resources on the Internet," was the highest at 4.13 with an SD of 0.56, indicating that most participants felt confident in locating health resources online. The lowest mean score was observed for item 6, "I have the skills I need to evaluate the health resources I find on the Internet," at 3.12 with an SD of 1.11, suggesting greater variability in participants' perceived evaluative skills.

Our research findings indicated that the Indonesian population had a considerably high overall DHL score (mean=3.51), comparable with several results from previous reports among Indonesian adults (Hua & Shaw, 2020; Ifroh & Asrianti, 2020; Khademian *et al.*, 2020). The findings indicate that while the participants generally reported a good level of confidence in finding health resources on the Internet, they were less confident in their ability to evaluate the quality of those resources. This discrepancy suggests an area where additional education and training could be beneficial. The relatively high standard deviations for items related to evaluating Internet resources demonstrate that there is a significant variation among individuals' perceived abilities in this aspect of digital health literacy.

The comparatively high score in the ability to find health resources suggests that accessibility may not be the primary challenge. However, skills in evaluating health information critically are not as widespread, which can affect the effectiveness of using the health information to make informed decisions. Future interventions might focus on enhancing these evaluative skills, thus enabling individuals to discern high-quality health resources from low-quality ones.

The findings also show that most respondents demonstrated a good knowledge of using the internet to answer health questions, identifying available health resources online, and utilizing internet-based health information for self-care. However, some respondents reported difficulty with knowing where to find helpful health resources on the Internet, telling high quality from low-quality health resources on the Internet, and it made them not feel confident in using information from the Internet to make health decisions.

Correlation between sociodemographic characteristics and digital health literacy level

This research sought to compare the DHL score with respondent characteristics which are gender, age, educational level, occupation, family income, chronic disease experience, use of prescribed medicine, internet usage, and device used for internet search as presented in Table III. A simple linear regression was performed to establish the correlation between DHL and the sociodemographic characteristics of respondents. A statistically significant correlation ($p < 0.05$) was observed with all variables, indicating a strong relationship between digital health literacy and various sociodemographic factors such as age, education level, occupation, family income, experience of having a chronic disease, use of prescribed medicine and intensity of internet use. These findings underscore the importance of considering these demographic aspects when addressing eHealth literacy initiatives.

Overall, a higher mean score of DHL was found among the respondents who were between 18–25 years old (n = 110;43.14%), had tertiary education level (n= 103;41.53%%), were university students (n= 97;40.93%), had more than 5 million rupiah family income (n = 148;62,18%), had experience of having a chronic disease (n=96;48.48%), used prescribed medicine (n = 112;46.47%), and had less than 10 hours per day internet use (n =145 ;68.40%) according to Table III in the study findings.

Notably, the data indicate a gender disparity, with females displaying higher digital health literacy, as shown by a higher e-HEALS score average compared to males (*p=0.021*). Age also plays a pivotal role; individuals below 25 years demonstrate lower digital health literacy contrasted with those in the 25-35 age bracket (*p=0.032*). Previous study mentioned that before the age of 60, age has little impact on online use, but as they become older, older people are less likely to utilize online services (Heponiemi *et al.*, 2022).

Educational attainment is a critical factor in digital health literacy. This research also shows that higher educational levels showed a higher DHL score. Participants with tertiary education exhibited significantly higher e-HEALS scores than those with primary education, indicating more substantial digital health literacy (*p<0.001*). This is in line with a previous study, which discovered that students at various educational levels have varying levels of digital health literacy (Adil *et al.*, 2021).

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Table I. Respondent characteristics (N=460)

VARIABLE	CATEGORY	N	%
Sex	Male	221	48.04
	Female	239	51.96
Age	<25	168	36.52
	25-<30	185	40.22
	30-35	107	23.26
Education level	Primary	120	26.09
	Secondary	179	38.91
	Tertiary (university)	161	35.00
Occupation	University students	180	39.13
	Part-time worker	102	22.17
	Health worker	56	12.17
	Non-health worker	122	26.52
Family income (monthly)	<3 million	124	26.96
	3-<5 million	133	28.91
	5-<10 million	132	28.70
	>10 million	71	15.43
Previous experience of having a chronic disease/hospitalization	Yes	134	29.13
Use of prescribed medicine	Yes	167	36.30
Intensity of internet use	<5 hours a day	120	26.09
	5-10 hours a day	145	31.52
	>10 hours a day	195	42.39
Device used for internet search	Smartphone	210	45.65
	Laptop	110	23.91
	Desk computer	140	30.43

Table II. Digital health literacy score among community in Indonesia (N=460)

NO	E-HEALS SCALE	MEAN*	SD
1	I know how to find helpful health resources on the Internet	4.13	0.56
2	I know how to use the Internet to answer my health questions	3.75	0.87
3	I know what health resources are available on the Internet	3.78	0.86
4	I know where to find helpful health resources on the Internet	3.25	0.69
5	I know how to use the health information I find on the Internet to help me	3.67	0.78
6	I have the skills I need to evaluate the health resources I find on the Internet	3.12	1.11
7	I can tell high quality from low-quality health resources on the Internet	3.19	1.13
8	I feel confident in using information from the Internet to make health decisions	3.15	1.17

Occupational status further delineates digital health literacy levels; university students and health workers have better digital health literacy compared to part-time and non-health workers ($p<0.001$). Similarly, to education level, the result shows that being a college student showed a higher DHL than other occupations. Matsuyama *et al.* (2013) identified a correlation between patient education and digital health literacy. They concluded that patients who had attended college had higher utilization of technology for getting health information than those who had not.

Family income correlates positively with digital health literacy, with individuals from families earning 5 million or more presenting better digital health literacy compared to those with lesser family income ($p<0.001$). These findings are consistent with the previous study, notably on internet availability and use among adults (Estacio *et al.*, 2019). Previous experience with chronic diseases or hospitalization also influenced digital health literacy positively ($p=0.016$), potentially due to increased engagement with digital health resources. Prescribed medication use was

associated with higher digital health literacy, possibly reflecting the necessity for individuals on medication to understand and manage their health information online (p=0.021). This might be caused by the respondent with chronic conditions and using a prescribed medicine being more confident and comfortable with technology since their condition might increase their motivation to use apps and the internet for their own health (Holt *et al.*, 2020).

The intensity of internet use revealed a stark contrast; individuals spending less than 10 hours a day on the internet had significantly higher digital health literacy than those spending 10 hours or more (*p<0.001*). The lack of a correlation between internet usage and the DHL score is surprising because higher internet usage is correlated with a higher percentage of respondents receiving information from the Internet (Ifroh & Asrianti, 2020). With easily accessible and extensive material, the Internet has replaced traditional media as the favoured source of mass information (Silva & Santos, 2021). However, because of the considerable volume of false information spreading without technical evaluation and appraisal, the Internet might be responsible for the decreased literacy levels (Allcott & Gentzkow, 2017).

Interestingly, the type of device used for internet searches did not show a significant association with digital health literacy levels, although laptops were slightly favored over smartphones.

Our research had some limitations. We could not access changes in digital health literacy and factors associated over time because our study was cross-sectional. The samples were self-selected based on a convenient sampling method and an online survey method. As a result, the generalizability of findings may be limited.

CONCLUSION

According to the findings of this research, the DHL score is still limited in technical ability. Improving respondents' educational status through computer training, smartphone access, and perceived usefulness is necessary to improve digital health literacy skills in evaluating the quality of the information. Knowledge of COVID-19, COVID-19 treatment, and several other factors can be investigated further to discover the correlation between Health Literacy and Knowledge of COVID-19.

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CONFLICT OF INTEREST
None to declare.

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